

# **DWR OROVILLE FACILITIES RELICENSING PROJECT (FERC Project No. 2100)**

## **STUDY #6: DOWNSTREAM EXTENT OF REASONABLE CONTROL OF FEATHER RIVER TEMPERATURE BY OROVILLE- THERMALITO**

*December 12, 2001*

### **1.0 INTRODUCTION/BACKGROUND**

Temperatures in the Feather River downstream of the Oroville-Thermalito Complex are managed for a number of purposes. Diversions of water for agriculture, particularly rice fields, in-stream fisheries, and the hatchery all have specific, often conflicting, temperature requirements. Currently temperatures are managed for the agricultural diversions, the hatchery, and at Robinson Riffle in the low flow section of the Feather River between the diversion dam and the Thermalito Afterbay return.

As water flows downstream in any river under a given set of flow and climatic conditions it approaches an equilibrium temperature based on those conditions. This temperature is the same regardless of the starting temperature at the upstream end of the river, if the starting temperature is farther away from the equilibrium temperature then it simply takes longer, or travels farther downstream, to get to the equilibrium temperature. This implies that for a given set of flow and climatic conditions that releasing colder water from the Oroville – Thermalito complex will only impact in-stream Feather River water temperatures for a limited distance downstream where the equilibrium temperature is reached.

The location of this point is critical to know for temperature management purposes at the Oroville – Thermalito complex so that cold water is not wasted attempting to manage temperatures at locations that are simply not physically possible to meet.

### **2.0 STUDY GOAL(S) AND OBJECTIVE(S)**

This purpose of this study is to quantify the ability of the Oroville-Thermalito Complex to control temperatures in the Feather River downstream of the Oroville-Thermalito Complex under a variety of operational and climatic conditions. The goal is to determine how far downstream the reservoir can reasonably control temperatures without jeopardizing the cold-water pool availability. This information will be used to assist in management of the Oroville Cold Water Pool and temperature operations of the complex.

### **3.0 RELATIONSHIP OF THE STUDY PLAN TO RELICENSING PROJECT PROCESS/PURPOSE AND NEED FOR THE STUDY**

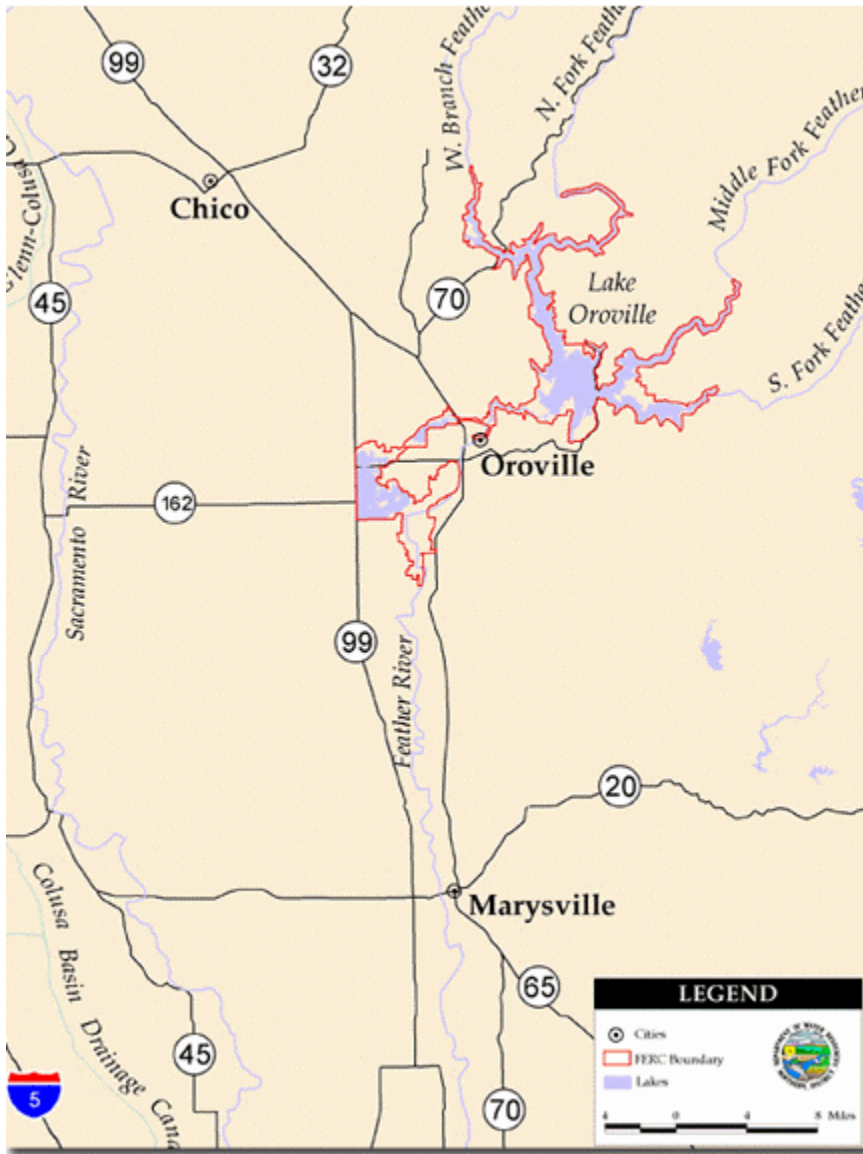
### ***Relationship of the Study Plan to Relicensing Project Process***

As part of the relicensing process questions have been raised about temperatures in the Feather River downstream of the Oroville-Thermalito Complex and how they could be managed to enhance the fisheries in the area. In order to evaluate fishery impacts of temperature operations it is essential to know how far downstream that the temperatures can be controlled. Without the knowledge it is impossible to set reasonable temperature standards or goals in the Lower Feather River. This issue has been raised in the Environmental Work Group discussions.

### ***Purpose and Need for the Study***

#### **4.0 SCOPE – STUDY AREA**

The scope of this study is the Feather River downstream from the Oroville-Thermalito complex to the confluence with the Sacramento River. If the study shows that it is possible to control temperatures to the Sacramento River the scope may need to be expanded, and the analysis approach re-evaluated.



## 5.0 GENERAL APPROACH

The study will use an existing temperature computer model of the Feather River from the diversion dam to the confluence with the Sacramento River. This model was used to estimate temperature relationships for operations purposes at Robinson's Riffle. The model will be used with varied assumptions about Oroville-Thermalito temperature operations and other parameters to develop the extent that the Oroville – Thermalito complex can reasonably control temperatures in this reach of the Feather River.

### *Detailed Methodology and Analysis Procedures*

### Task 1. Obtain Existing Feather River Temperature model

This task is to obtain the existing Feather River temperature model and verify the ability to run the model with all required hardware and software.

#### Subtasks:

- A. Acquire rights to use RMA-10 and install on a PC. (RMA-10 is a commercial product used as the 'engine' to drive the Feather River Temperature model; it has already been verified)
- B. Obtain model documentation, both RMA-10 and for the input data sets
- C. Obtain input/output data set(s) for existing model
- D. Run existing input data sets and verify with existing output datasets

### Task 2. Design a sensitivity analysis

This task will design the scope of the analysis. This activity will result in a full definition of the combinations of flow, temperature, and climatic conditions to be evaluated under this study. The parameters to be evaluated at a minimum include:

- Oroville Release Rate
- Oroville Release Temperature
- Thermalito Afterbay Release Rate
- Thermalito Afterbay Release Temperature
- Yuba River Inflow Temperature (may be lower in future than in existing data because of on-going activity in Yuba Basin)
  - Yuba River characteristics may be changed due to a temperature-monitoring device to be installed at the Englebright Reservoir dam. This may impact the ability of the Oroville Reservoir to control downstream temperatures.
- Climatic Conditions (Time of year, monthly seasonally)
- Any other significant inflow temperatures (hatchery inflows)

#### Subtasks

- A. Select parameters for inclusion
- B. Select appropriate ranges for each parameter
- C. Select appropriate combinations of parameters
- D. Develop matrix of model simulations to be performed
- E. Determine placement of nodes for intake temperatures

### Task 3. Perform the model runs

#### Subtasks:

- A. Ensure that the Feather River Temperature model has the capability to perform all simulations developed under Task 2. (This will require coordination with Engineering and Operations Study Plan No. 1 – Model Development.)

- B. Develop database to store results of model runs
- C. Setup and run each simulation specified in D above, store results in database

Task 4. Analyze the results to define area of impacts

Subtasks:

- A. Extract data from database
- B. Determine downstream temperature profile
- C. Determine “reasonable” control distance
- D. Develop relationships between parameters and downstream control distance

Task 5. Write final report

Complete a report documenting the procedures and results of the evaluation.

## **6.0 RESULTS AND PRODUCTS/DELIVERABLES**

### ***Products/Deliverables***

Study Plan Summary Report(s)

The final deliverable of this study will be a report including recommendations on appropriate relationships to use to evaluate ability of Oroville – Thermalito Operations to control temperatures in the Lower Feather River. The report will be suitable for use in other studies to provide guidance on appropriate operation requirements and/or guidelines for temperature in the Lower Feather River.

## **7.0 STUDY PLAN COORDINATION AND IMPLEMENTATION STRATEGY**

### ***Coordination with Other Resource Areas/Studies***

This study will be coordinated with a number of other Engineering and Operation study plans:

Study Plan No. 1 - Model Development

Study Plan No. 1c - Oroville Reservoir Temperature Model Development

Study Plan No. 1d - Thermalito Complex Temperature Model Development

Study Plan No. 1e - Feather River Temperature Model Development

Study Plan No. 6 - Feather River Temperature Regime Analysis

This study will also be coordinated with the Environmental Work Group since the study will be used to assist that group in in-stream fishery related issues.

## **Related Issues:**

### ***Study Plan Tracking/Regulatory Compliance Requirements***

There are no regulatory tracking and compliance requirements for this study.

## **8.0 REFERENCES**

Deas M.L., C.L. Lowney, G.K. Meyer, J.D. Anderson, C.B. Cook, J.J. Fellos, M.M. Kirkland, X. Wang, G.T. Orlob, I.P. King (1997), *Sacramento River Temperature Modeling Project – Final Report*, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of California at Davis, January.

Cook, C.B., O.T. Orlob, *Numerical Estimation of Dynamic Water Temperature Fluctuations at Compliance Point Robinson Riffle – UC Davis Feather River Computational Model*, Water Resources and Environmental Modeling Group, Center for Environmental and Water Resources Engineering, Department of Civil and Environmental Engineering, University of California at Davis, May 2000.

## **ATTACHMENTS**

None